The Excavating Engineer

Vol. 16 SEPTEMBER 1922 No. 9

Electric Shovel Operation, Chile Exploration Co.

Description of one of the largest open-cut copper mines in the world. Excavation handled by eleven electrically operated shovels.

HIGH up in the Andes Mountains in Chile, 10,000 feet above sea level, is one of the greatest open-cut copper mines in the world. Centuries ago these deposits were worked by the Incas and later by the Spaniards, both by underground methods. In 1912 the Chile Exploration Company acquired control and immediately started operations on a large scale. Today this property is known as one of the largest copper ore deposits in the world.

The principal interest in these operations, to the engineer and miner interested in excavation, is the fact that the excavating machinery is now entirely operated by electricity.

Chuquicamata is a region devoid of vegetation. The panorama is one of great barren mountain sides with an extraordinary blending of blue, green, brown, yellow and red from the exposed rock of the cuts.

The mines are located inland from Antofagasta 120 miles, to which point they are connected by rail.

The ore body is 1⅝ miles in length by ½ mile in width, part of an immense deposit 3 miles in length. The ore so far developed is estimated to contain in round figures 700,000,000 tons averaging 2.12% copper. This ore is at present being mined in five different grades running from one to four per cent copper.

Electric Versus Steam Shovel Operation

Shortly after the Chile Exploration Company secured control of this property they purchased twelve 95-Ton Bucyrus shovels which had been used for the excavation of the Panama Canal. These were used for stripping and mining the ore. These shovels burned crude oil for fuel. The oil was a crude petroleum imported in tank steamers from Mexico and the United States.

During the war it was impossible to obtain a sufficient supply, consequently coal was used at a cost running from $35 to $50 per ton.

The decision to change from steam to electric shovels, however, was not influenced by the high cost of fuel. The Company's engineers made an extensive investigation as to the relative efficiency of electrically operated excavating machinery and a test was carried out which demonstrated that the electric shovel gave them much higher efficiency at a considerably lower operating cost than the steam shovel. The conclusions of the investigation were so far demonstrated that as a result the change from steam to electric shovels was made as quickly as possible to the end that they now have in service two 225-B Bucyrus electric shovels, equipped with 85-foot booms and 8-cubic-yard dippers, and nine 103-C Bucyrus electric railroad-type shovels with 3½ and 4-cubic-yard dippers. Steam shovel operation was finally discontinued in March, 1921.

It is an interesting comparison to note that in 1920 the average cost of operation of the steam shovels was 17.2 cents per cubic yard, whereas in 1920 the 103-C electric shovels cost but 4.5 cents.

Pit Equipment

The open-cut operations are about two miles from the crushing plant and smelter. The ore is loaded into 70-Ton ore cars, originally designed for bottom discharge. An average of 20 cars make up a train. The locomotive equipment for all purposes consists of eleven 54-Ton and six 85-Ton Porters, two 110-Ton Americans, one 54-Ton and one 65-Ton Baldwin, two 25-Ton Vulcans and nineteen 70-Ton locomotives formerly used on the Panama Canal.

20-Yard Western dump cars are used for handling the stripping.

Shovel Operations

It is natural that the most interesting unit in the mines are the two big 225-B Bucyrus electric shovels. As stated before these shovels are equipped with 85-foot booms and 8-cubic-yard dippers, each weighing in the neighborhood of 336 tons in working condition.

Until quite recently this mine was being worked on four 100-foot benches known as benches B, C, D and E, "B" being the top bench. Experience with the first 225-B conclusively proved that a 50-foot bench can be operated with greater

economy, greater safety and considerably greater sustained output over a period of time than the 100-foot bench. Consequently, the plan of operation has been changed with this view in mind.

When operating against a 100-foot face the first shovel spent the greater part of its time side cutting. In the process of changing this bench arrangement the first shovel, however, was put through a trial thorough cut. This cut contains about 130,000 cubic yards of ore and waste. The time consumed was from May 25 to August 12, 1921, working on 8-hour shifts per day. The average output was 2228 cubic yards per shift, the highest shift being 2763 cubic yards in 8 hours. The cut was 110 feet wide, the height varying 35 to 80 feet.

The second 225-B shovel was put into operation during February, 1922. It was erected on bench C and its first work was cutting down from bench C to the new inter-level and establishing a 50-foot bench between old benches C and D. Our photograph illustrates this shovel in the course of making this cut.

The shovel cut down 47 feet in 300 feet. This was done by blocking under the front trucks and keeping the rear trucks on the ground. A close examination of one of our views illustrates this method clearly.

A Mummy Dug Up by One of the Big Revolving Shovels

A constantly increasing efficiency of operation has been maintained. In 1921 the average output per shovel shift was 1646 tons whereas for the first quarter of 1922 it was 2464 tons. This is taking the figure for the month of February. The highest shift yet obtained according to available figures now at hand is 5250 tons in 8 hours working against a 45 to 47-foot face. This material runs from 1½ to 1¾ cubic yards per ton. The above output was made in March, 1922.

Method of Blasting

Mining at Chuquicamata is an illustration of rock being broken on perhaps a vaster scale than in any other part of the world. Previously the method employed was the tunnel method. These

Loading 70-Ton Ore Cars on the New 50-foot Bench

tunnels were driven parallel to the working bench; entrance to them was by means of shafts and cross-cuts, the distance between the drilling tunnels depending upon the height of the ore body. The tunnels are 6½ feet high and 5 feet broad. Extensive tests are now being carried out to determine whether the churn-drilling method is more satisfactory. The holes are driven on an average of 16 feet apart and 55 feet deep. It has been found that this method of blasting breaks up the ground well and has resulted in higher shovel output. Furthermore, with the 50-foot face instead of 100-foot face there is less danger in burying the shovel in slides. However, no final decision has been reached, as we go to press, as to the method ultimately to be adopted.

Trojan and Du Pont dynamite is used, seven

to eleven cases to a hole. Extensive use is made of jackhammer drills driven from a central compressor station for the purpose of breaking up rocks that are too large to go through the crushers.

A complete description of the mill and the method of leaching the ore may be found in the Mining and Scientific Press for June 18, 1921.

One of the Nine 103-C Bucyrus Electric Shovels Digging the Ore

Burr Wheeler is general manager of the mines; the superintendent is Matthew Sample and the general foreman is Richard Whitcomb.

Road Building in the Blue Ridge Mountains of North Carolina

Description of the O'Brien Construction Company's Work on the Ashville-to-Atlanta Highway

FOR the past two years the O'Brien Construction Company of Birmingham, Alabama, have been busily engaged on several contracts on the Ashville-to-Atlanta Highway through Haywood, Jackson and Macon Counties, in the southwest portion of North Carolina.

Upper pit with shovel and crusher. The car is pulled to the shovel by mule and hoisted up incline by hoisting engine also shown in view.

Running through the glorious Blue Ridge Mountains, work in places has been very heavy and has called for a variety of methods of attack.

Mr. P. H. O'Brien, the president of this Company, is one of the most capable contractors in this part of the country, in fact he undoubtedly inherited much of his genius in this line from his father, W. P. O'Brien, who built the old Richmond-Danville Railroad fifty-two years ago.

Two years ago in July, "Pat" O'Brien started his first shovel on this section of the Ashville-to-Atlanta Highway. Since that time he has run across a steady strain of trouble, all the way from extreme hardness of the rock, constant labor turnovers and steady rains. The first of these did not bother him but the last has considerably delayed the completion of this work. The incessant rains have caused numerous slides which have kept one shovel busy re-working grades until Mr. O'Brien found himself late in surfacing.

The original contract on this work amounted to 11.8 miles in Haywood and Jackson Counties calling for the excavation of 300,000 cubic yards, the contract amounting to $200,000. This project is known as 70-A. The Haywood work was completed in February of this year and the work in Jackson County will be completed by the time

Two Elevating Graders Were Used to Prepare the Surface for the Gravel and to Spread the Gravel to the Proper Depth

Finishing Up Sub-Grade Ahead of the Gravel with an Elevating Grader

A Holt 10-Ton Tractor with 3½-yard Trailers, Hauling Gravel from Crusher Over Completed Section of Road

Completed Section, Lower End of Work, Crushed Gravel Surface

Views on Project 70-A Jackson County, North Carolina, in the Blue Ridge Mountains

this magazine reaches our readers. This last work through Jackson County, consisting of four miles of exceptionally heavy grading, is the main subject of this article, but before going into a description of this work we might mention that in addition to the above, Mr. O'Brien now has one shovel at work on Project No. 962, a $113,000 job from Franklin, North Carolina, to the Georgia State Line, a distance of thirteen miles. This work has only recently been started and consists of waterbound macadam, grading and surfacing.

In Jackson County he has just completed a large masonry contract and in Madison and Yancey Counties he is about half way through another masonry contract consisting of $65,000.

Pit and crusher at lower end of Project 70-A, Jackson County. The "P. H. O'Brien Jr." in the creek bottom.

Further than this he has only recently bid in on a $152,000 job of surfacing in Avery County, all of which goes to prove that Mr. P. H. O'Brien is a contractor of no mean worth in the minds of the good people of southwestern North Carolina.

The Jackson County Work

This work runs through the heart of Blue Ridge Mountains and consists of 88,000 cubic yards of common excavation and borrow and 20,000 cubic yards of solid rock which were taken at war-time prices, namely, 68c for the common excavation and $2.50 for the solid rock.

The work was grading and surfacing. The gravel surface, according to the contract, was to pass through a 2½-inch screen. This item of the specifications was taken care of by Mr. O'Brien by putting in two crushers in his pit. The material was choked down as it went through the crushers, consequently it was possible to use creek run gravel without the necessity of screening.

The excavation was pretty well distributed; some heavy cuts were encountered where the material was hauled off in wagons. Part of the work was overcasting and part fill where the material was obtained from borrow pits. The greater part, however, was along the edge of mountains where the shovels cast over and off the grade. The rock was an exceedingly hard granite, the hardest, in fact, that these experienced contractors have ever encountered in their long experience. The earth was the prettiest to be moved that could be imagined, but, as stated before, the advantage gained by this was considerably offset by the incessant rains which caused numerous slides.

The excavation is all steam shovel work. For long distances the contractor must literally blast his way through the mountains. Mr. O'Brien owns three Bucyrus 14-B revolving shovels which he has named after his three children the "Ollie Ann E," the "P. H. Junior" and the "Sarah Elizabeth." The first of these is now engaged in Macon County on Project No. 962 which we have mentioned

above. When the heavy cut was finished these shovels were put into two separate pits, one in the middle and one at the lower end of the project. In addition to these shovels Mr. O'Brien has fifty mules, ten horses, three tractors, two Galion crushers and twelve 1½-yard Watson dump wagons. He also has two elevating graders, a Russell and a Galion "Little Giant." These graders are used to form the nearest correct elevation for levelling the gravel to a uniformly smooth grade after having been placed. The tractors are of the latest design; one of them is a 10-ton Holt with a 3½-yard trailer, the other a 15-ton Holt and the third a 7-ton Sandusky.

When asked about the output of these shovels we are advised that "P. H. Junior" has averaged 700 yards for a period of two years and has had "less repairs than are necessary on a sewing machine." Furthermore, when bucking a heavy rock cut this machine averaged 500 yards a day in six months of work. The "Sarah Elizabeth" has been in the gravel pit on the upper crusher and according to our informant has run so smoothly for the last two months that a bird has actually hatched three little birds under the coal bunker. Coming from the source from which it did we have no reasons to doubt the accuracy of this extraordinary statement.

The coal was obtained from the Harlam mine, this haul being 2½ miles and was delivered mine run at $5.00 a ton.

This work through Jackson County is typical of mountain road construction in North Carolina.

Mr. O'Brien's field headquarters are at Balsam, not far from his birthplace at the highest point in the pass, more than 2,500 feet above sea level in one of the most mountainous districts in the South.

The gravel for the surfacing of this road was obtained, as stated, from two pits, one at the middle of the project and one at the lower end. Both pits had approximately the same type of equipment. The shovels worked up a creek bed loading the gravel into cars which were pulled by mules to the incline. Here they were hoisted up to the crusher by means of a hoisting engine. Material was then dumped through grizzlies into the crusher, rock and gravel running through together, forming an excellent road surface material. From here the material was elevated into the bins from which the wagons and trailers were loaded. The material from the lower crusher was taken to the upper end of the work with an average three-mile haul. The average haul from the upper crusher was 1½ miles.

The superintendent on the job was Mr. O. H. Walton. The "Ollie Ann E" was operated by W. C. Painter, the "P. H. Junior" by W. P. Ganns and the "Sarah Elizabeth" by Ben H. Everett.

Flood Protection Work on the Louisville & Nashville

Description of S. A. Lacy's Dragline Contract Near Orange Grove, Mississippi

ALONG the main line of the L. & N. R. R., between Mobile and New Orleans, there is a low-lying strip of land on each side of the Pascagoula River Crossing. At this point the roadbed is carried on a fill in order to be above river floods and tide water variations. At high tide, water surrounds the fill, and subjects it to some washing action. In recent years the fill has become narrower than originally made, due to this washing action. In order to correct this the railroad company let a contract last spring for widening this fill to S. A. Lacy, general contractor of Anniston, Alabama.

The filling material was secured from a borrow pit about ten miles distant from the fill near Orange Grove, Mississippi. A level tract of ground about 2000 feet long was used as a borrow pit. The material was a very tenacious heavy grade of pipe clay; and was selected because of its ability to withstand weathering and wave action. Work was commenced about May 1 and finished on August 20, 1921.

Dragline Operation

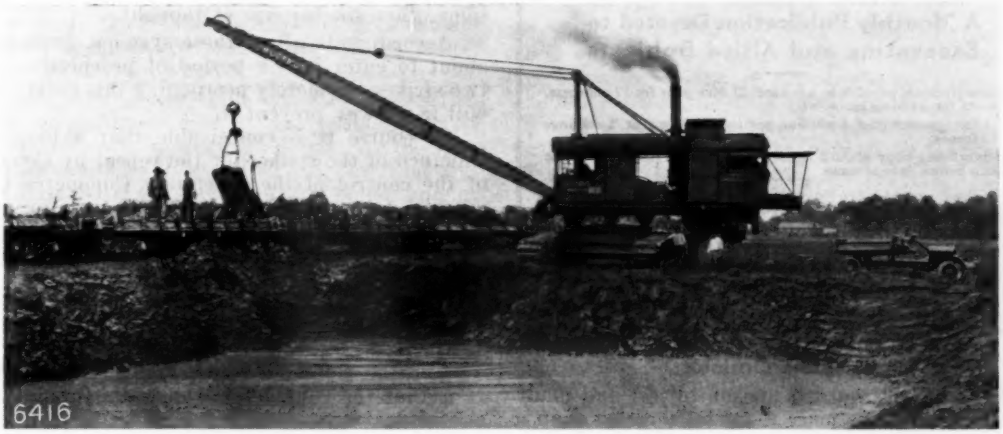
The loading equipment consisted of a Bucyrus Class-9½ dragline excavator, mounted on caterpillars. A spur track from the main line was laid along one side of the borrow pit. The dragline loaded along this; commencing at one end and backing away from the pit as the work progressed. Mr. Lacy was able to remove a cut about 85 feet wide and 15 feet to 18 feet deep, and still had ample reach left in order to load on standard gauge flat cars. As soon as a cut was completed, the loading track was dismantled and moved over 85 feet to the new center line and rebuilt. Due to the big move after each cut it was found cheaper to do this instead of lining the entire track over. The material in the pit was a very heavy stiff clay which loaded the bucket beyond capacity, but no trouble was met in handling this heavy work. About 5 feet of ground water seeped into the pit, but this in no way interfered with the work.

Transporting the Material

Material was carried from the pit to the fill on standard gauge flat cars furnished by the railroad, the average haul being about ten miles. Three locomotives with crews and three trains of flat cars comprised the transportation equipment. One engine was used at the pit to spot cars while be-

ing loaded. Another handled the trains between the pit and fill. The third handled the cars on the dump and spread the material. By this means excellent car service was maintained at the dragline. Unloading was accomplished by a Lidger-

The total yardage placed was about 110,000 yards, the average monthly output being about 25,000 yards. The dragline was operated on a single 10-hour shift basis. The best runs for a single shift were about 1250 yards. Water was



S. A. Lacy's Class-9½ Bucyrus Dragline Loading Flats on the Louisville & Nashville Railroad Near Orange Grove, Mississippi

wood unloader, pulling a ballast plow over the flats. No side boards were used on the cars. In spite of this, due to the tenacious character of the material, about fifteen yards were easily carried per car. Twenty-four cars were hauled in each train. About 100 cars were kept in service so as to insure an ample car supply.

As soon as a trainload was plowed off the unloading engine operated a Mann spreader in order to widen out the fill to the final width. Due to the expected washing action, the fill was carried to a top width of approximately 50 feet.

pumped from a nearby source. Coal was hauled from a siding to the machine by means of a 1-ton Ford truck. In wet weather a wagon with team was found to be more reliable. About two tons of coal were burned daily.

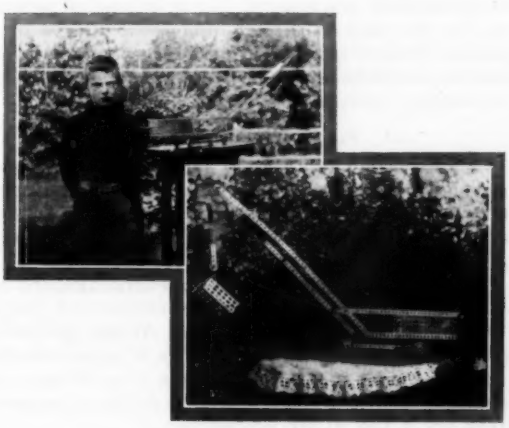
The operating crew consisted of an operator, a fireman, two ground men, one pump man, and night watchman. Mr. Oscar Carver, who has been handling Bucyrus draglines since the days of the cable swing, was at the throttle. Gus Maxwell kept a full head of steam. We are indebted to Mr. S. A. Lacy for the above information.

Another Budding Genius

We are very glad indeed to publish herewith a photograph of a model dragline excavator which was constructed by Master Gurth E. Claydon, son of Mr. Claydon of Claydon Brothers, Limited, of Winnipeg, well-known Canadian contractors. This young gentleman was evidently inspired by the model of the steam shovel made by a young Dutch boy which we illustrated in our May number. We quote his letter as follows:

"My dad showed me page 141 of the May, 1922, Excavating Engineer where you have a picture and news about a model steam shovel made by a Holland boy. Perhaps you would like to know about a model dragline excavator made in Canada. I inclose photos of a model I made from a Meccano set. It is full revolving; can hoist, lower and dump its bucket just like a real machine. I was eleven years old last January."

We are sure that our readers will agree with us that Master Claydon will one of these days step into his father's shoes and carry on his father's good name in Canada.



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Business Outlook

Many a true word is spoken in jest and many a cartoon contains more financial forecast than a whole page of statistics. Just such a cartoon recently appeared. It represented the Nation's business, in the guise of many auto trucks, waiting at a railroad crossing, while two freight trains (labelled respectively "Railroad Strike" and "Coal Strike") backed and filled.

That is exactly the situation as we go to press. The country is on the eve of prosperity. Business moves in cycles, which follow scientific laws almost as exact as those of any other science. This is generally accepted, whether one be a disciple of Roger Babson or of Alexander Hamilton or of some other similar line of thought.

According to all of these systems, business is about to enter into a period of prosperity. The two strikes are merely postponing this entry; they will in no way prevent it.

Of course it is conceivable that a long continuance of the strikes, or the repeal by Congress of the control of the Interstate Commerce Commission over *Intra*state freight rates, or some other untoward event, might plunge us back into a period of depression. But the stability of the stock market, even in its present dullness and inaction, indicates the joint judgment of the best minds of the country, that no such calamities are at all likely.

And the moral to be drawn from all of this? It is that the contractor who waits for the business situation to clear, before ordering equipment and supplies, is going to get left at the post. That this is so is shown by the firmness of cement, machinery and other contracting supplies. When the situation clears and the faint-hearts all rush into the market, prices should advance. Now is the time to order.

· FIELD NOTES ·

Instructions on Care and Maintenance of Excavating Machinery

This is the second of a series of articles which we intend to publish on the care and maintenance of excavating machinery. It is intended primarily for the man on the job, and we would be very pleased indeed to receive any comments, suggestions or criticisms which any experienced shovel or dragline operator might care to make.

II. Scale Chamber Boilers

A short time ago we ran across a shovel operator who had operated a revolving shovel equipped with a scale chamber boiler for a period of several months without even being aware of its existence or its purpose.

The scale chamber is a patented feature in some steam shovel and dragline boilers (all Bucyrus boilers are so equipped). When properly understood, this scale chamber is of great advantage, especially when the machine is working in a location where the feed water is dirty or impure. Here are a few of its advantages.

First—The tube sheets, the barrel and the tubes, and especially the water leg of the boilers are kept free from scale and mud.

Second—The boiler will operate more efficiently with greater continuity of service.

The greater continuity of service is attained due to the fact the tubes are kept cleaner. This insures more uniform temperature conditions of the boiler materials, thereby causing more uniform expansion and contraction of the parts, and further prevents parts from "burning out" due to local or heat concentration.

Increased efficiency is secured because clean flues and water legs enable a more direct transfer of heat through the boiler materials into the water, whereas scale prevents a proper transfer of heat as it tends to insulate the tubes. Tests show that scale two hundreths of an inch thick will decrease the conductivity in heat transmission from two to nine per cent depending on the hardness of the scale. Thus it is evident that the scale chamber, by preventing the formation of scale, improves the efficiency of the boiler.

The function of the scale chamber is thermally to deposit, in the form of a soft sludge, scale

forming matter that may be held in the feed water in solution, and to give the matter held in suspension an opportunity to settle while being heated, thus insuring the discharge of purified water into the boiler. The extent of purification depends on the impurity content or quality of the water used. The scale chamber boiler must not, however, be considered as a "cure-all" for miscellaneous boiler feed water troubles.

The design of the scale chamber for vertical boilers is shown in Fig. 1, and locomotive type boilers is shown in Fig. 2. Primarily, the scale chamber consists of a cylindrical partition wall concentric with the barrel of the boiler and extending about 3 inches above the water line, thus forming a chamber 4 inches wide on locomotive type boilers and 2½ inches wide on vertical boilers.

The scale chamber operates in the following manner.

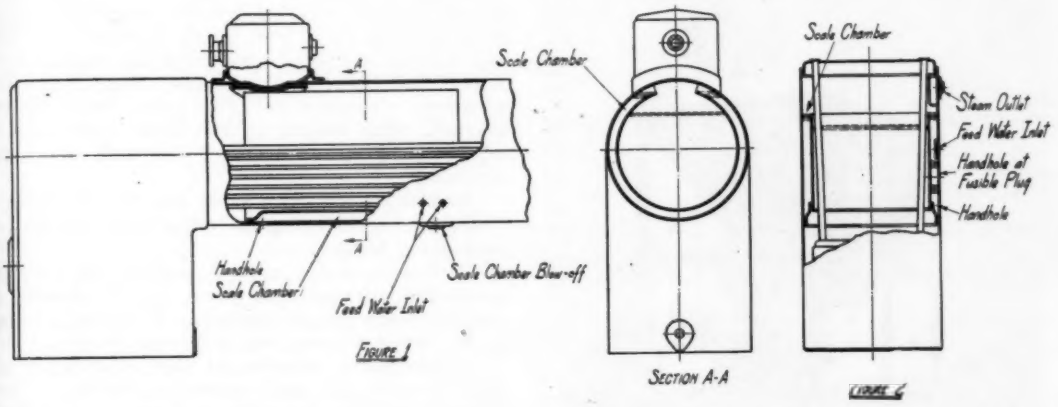


FIGURE 1 FIGURE 2

The feed water is introduced near the bottom of the chamber and finds its exit at the upper edges. It is thus trapped in the chamber and heated before it enters the boiler proper. As the chamber has a large surface in contact with the steam liberating water in the boiler, and is in close proximity to the boiler tubes, the feed water it contains is rapidly heated until its temperature is about that of the water in the boiler. This temperature will vary from 337° or 99 pounds gauge pressure to 354° or 125 pounds gauge pressure depending on the boiler pressure.

Upon this rise in temperature of the water before it enters the boiler proper depends the action of the scale chamber. Various substances contained in the feed water are precipitated at temperatures from 212° to 302° F. It is of special interest that the most troublesome impurities, such as sulphates of lime which precipitate at 240° F. and the carbonates and tannins which precipitate at 240° F. are thus readily removed from the water. Other impurities are precipitated at the following temperatures:

Phosphate of lime	212° F.
Oxide of iron and silica	212° F.
Carbonate of lime	302° F.
Sulphate of magnesia	302° F.

This foreign matter, being separated from the feed water, settles as a sludge at the bottom of the chamber. Since the chamber is not exposed to the hot gases in the flues and there is no tendency for the sludge to solidify or bake, it can readily be blown out through the blowoff at the bottom of the scale chamber.

Results Obtained—Under average conditions, when the scale chamber is operated properly, namely, by blowing off the sludge several times daily, the tubes and sheets of the boiler will be kept free from scale and mud and more efficient boiler operation together with greater continuity of service are assured.

Instructions for operating the boiler will be found attached to the steam gauge. These instructions are as follows:

1. The scale chamber bottom blowoff on less modern machines and the surface blowoff should be opened at least once a day; oftener if bad water conditions prevail.

2. The main bottom blowoff of the boiler should be operated at least every second day.

3. These blowoffs should always be opened slowly, be allowed to discharge for a few seconds and should then be closed slowly.

4. After blowing down the water in the scale chamber always feed until the water in the gauge begins to rise.

5. Once a month all handhole covers, manhole covers and washout plugs should be removed and the boiler washed out thoroughly.

At this time the portion of the barrel between the front tube sheet and the end of the scale chamber should also be drained out through the valve

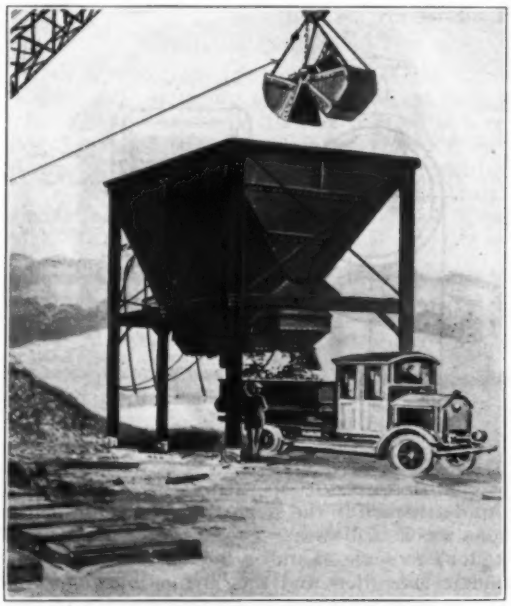
or washed out through the hand hole Y. Also be sure to wash out between the scale chamber wall and outer tubes.

When cleaning and washing out the boiler, first draw the fire and allow the steam pressure to drop to not more than thirty pounds before opening any blowoff valves. Then open all blowoff valves, and when there is no pressure on the boiler, and after all the water possible is drained out, then open the handhole plates. After the boiler is cooled off, which will take from two to four hours, wash thoroughly. Most of the scale forming material will be found in the scale chamber. A moderate amount of pressure on a hose will be sufficient to clean the boiler. No scraper should be necessary.

DEVICES YOU OUGHT TO KNOW ABOUT

All-Steel Storage Bin and Measuring Batcher

Conditions on the average road-building job are such as to make it necessary to set up a storage bin not once but three or more times during the progress of the job. It has been found that when the wood bin is dismantled, there is really nothing worth saving but the heavy posts; new lumber must be used, ingenuity put again to the test and parts made to fit. It has, moreover, been the experience of many contractors who have erected wood bins for any one job, that their bin costs for the job were greater than the purchase price of a steel bin.



Blaw-Knox All-Steel Storage Bin and Measuring Batcher

For this reason there is an increasing interest among contractors in all-steel bins. The Blaw-Knox all-steel storage bin, illustrated herewith, represents permanent plant. Moreover it enables the contractor to vary his bin capacity in accordance with the size of the job. This bin presents in one standard portable structure all the devices which can possibly be adapted to a storage bin for time and labor-saving.

This storage bin is easily set up and taken down. It meets all conditions as they change from job to job. It is made of standard units which will give the contractor storage capacity of from 15 tons to 75 and larger if required. This bin is of the correct height to obtain service from a portable crane and clamshell bucket, and has sufficient clearance for any truck body on the market. The weight is less than wood bins of equal capacity, and occupies less space when dismantled.

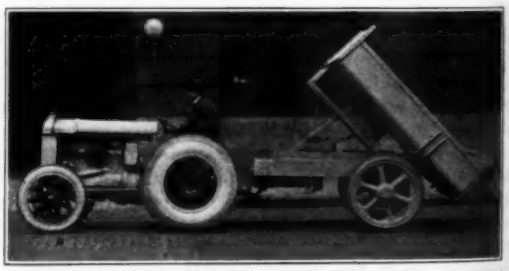
Combined with this steel bin, the Blaw-Knox Company are offering an adjustable batcher, or measuring hopper.

This new device makes possible the accurate measuring of sand and stone, and is claimed to contain many unique features. It can be attached to any wood or steel bin at present in use.

Information relative to the Blaw-Knox all-steel storage bin and measuring batches, Blaw-Knox road forms for roads and streets, and Blaw-Knox Truck Turntables, may be obtained from the Blaw-Knox Company, Pittsburgh, Pa.

An Innovation in Trailers

The announcement of a new two-wheeled trailer known as the Trail-Ford, designed for use with a Fordson tractor will undoubtedly be of interest to our readers.



Trail-Ford Attached to Fordson Tractor

This two-wheeled trailer is so constructed as to connect directly to the Fordson rear axle housing by means of castings which clamp solidly on the housing.

It can be equipped with two or three-yard Winsor gravity end dump bodies or six-yard side-dump bodies. It can also be equipped with a street flusher or water wagon, oil or milk tanks.

The Winsor body is extremely fast in operation. It is claimed that it required but three seconds to dump a load. The driver does not have to leave his seat, and the tail-gate opens and closes automatically. It can be installed in 30 minutes.

The Trail-Ford is particularly recommended for use with a steam shovel as two Trail-Fords and one Fordson tractor is equivalent to operating two motor trucks, for while one trailer is at the shovel, the other is on its way to the dump.

The trailer is fitted with indestructible steel wheels on which are mounted 6-inch tires. The band brakes are operated from the driver's seat. The rated carrying capacity is 5 tons, 40% of which is carried by the Fordson's rear axle through the wishbone.

Further information regarding the Trail-Ford may be obtained from the Automotive Utilities Corporation of Detroit, Michigan.

A Correction

Capt. Hoar points out that in his article on page 242 of the last issue, entitled "A Novel Power Shovel," there is a slight error in figure 4. The resultant thrust should, of course, contain a component parallel to A_1, and equal to the component parallel to F. This is due to the fact that every foot of thrust lengthens rope A_1 by one foot, owing to the ratio between the shipper-shaft drum and pinion.

This correction in no way affects the quantitative value of the resultant thrust nor the conclusions drawn therefrom.

New and Larger Motor in Smith Excavator and Loader

The consistent service provided by the Wisconsin four-cylinder gasoline engine used on Smith Pavers has led to the adoption of this make of motor on Smith Excavators and Loaders, made by The T. L. Smith Company, of Milwaukee. The new motor, shown in one of the accompanying illustrations, has 3-inch bore and 5-inch stroke and runs at 1200 R.P.M. It provides about 40 per cent additional power over the previous equipment. A recent installation of this new-motored machine is shown in Figure 2. Here the excavator and loader is seen excavating and loading gravel from a gravel pit. The loaded scraper is

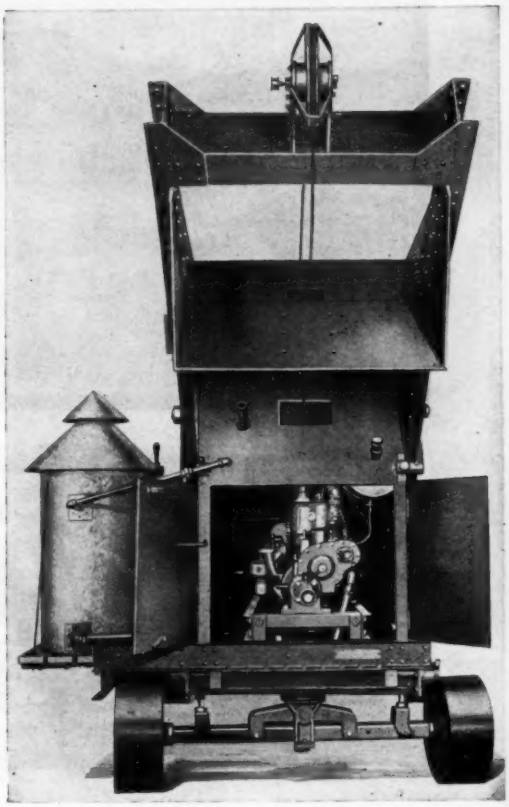


Fig. 1. End view of Smith Excavator and Loader showing new motor.

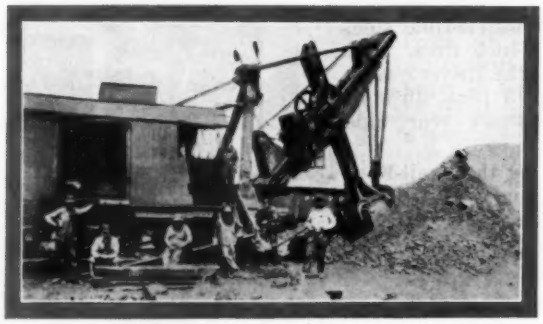
brought to the excavator and dumped directly into the waiting truck.

Smith Excavators and Loaders are used for general dragline excavating; for digging basements and loading directly into wagons or trucks on the surface; for grading, stripping, and miscellaneous earth handling and loading.

Further information may be obtained by addressing and mailing the enclosed blank postal card to The T. L. Smith Co., Milwaukee, Wis.

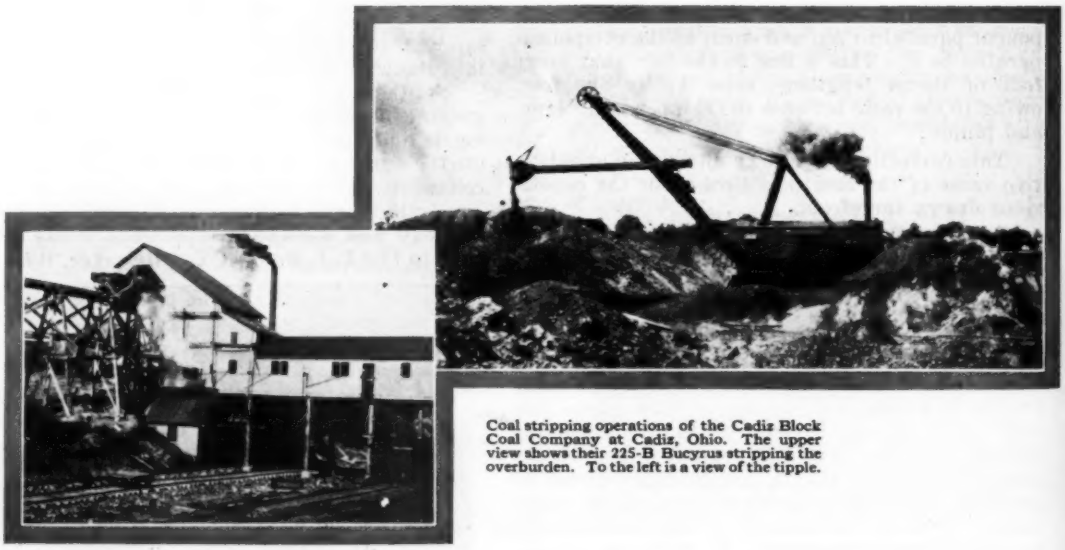
Fig. 2. Smith Excavator and Loader on gravel pit work.

The mines of the Chile Exp... Company. Within the past two years steam ... ration seded by electric shovels, eleven ... are in described in an article on page ... number

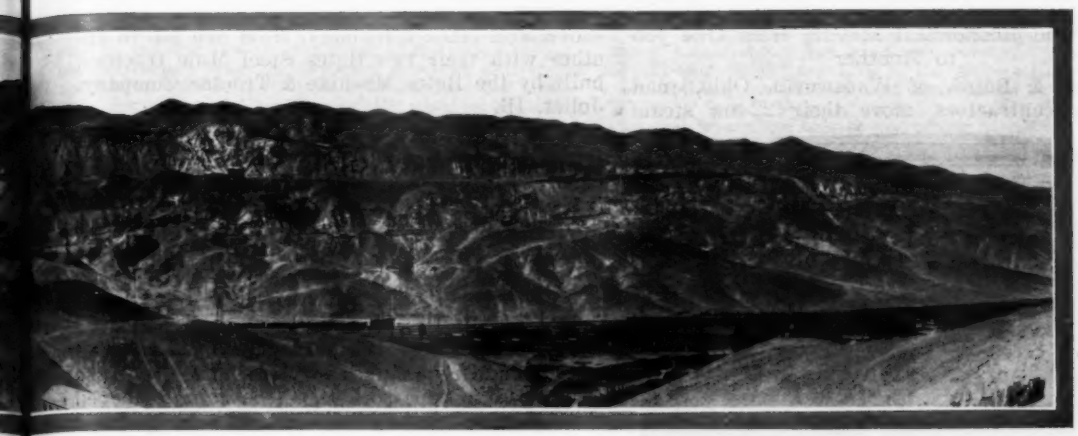


This photograph illustrates a 65-ton Bucyrus shovel owned by the Northern Pacific, loading storage coal at Spokane, Washington.

The shovel is operated by William Kirbyson, to whom we are indebted for the view. This shovel is twenty years and seven months old and has been kept busy most of this long period of time. In spite of this fact Mr. Kirbyson tells us that they loaded 160,000 tons of coal between March 20th and July 20th with only 45 minutes' delay due to a broken swing cable. He tells us that this "old boat" will do equally as well in hard digging. He advises that one reason for its good performance can be laid to the fact that he has Joe Schultz as craneman and George Garrison as fireman.

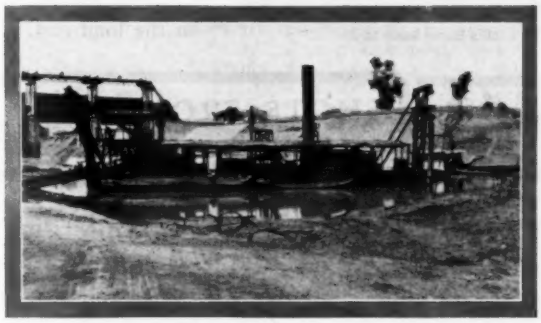


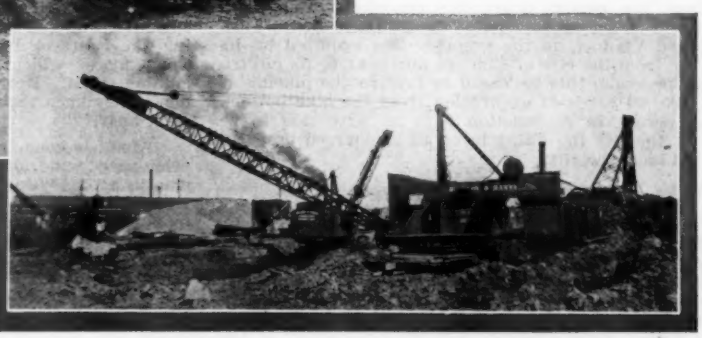
Coal stripping operations of the Cadiz Block Coal Company at Cadiz, Ohio. The upper view shows their 225-B Bucyrus stripping the overburden. To the left is a view of the tipple.



pany at Chuquicamata, Chile. ration has been entirely super- are in use. This mine is fully nber.

A Bucyrus 12" hydraulic dredge digging a canal from the Prasak River to the Barrage Pit on the Prasak Irrigation Project of the Royal Irrigation Department of Siam. A 16-inch Bucyrus hydraulic dredge, three Bucyrus and one Marion dragline excavators and one 65-ton Bucyrus shovel are in use on this project.



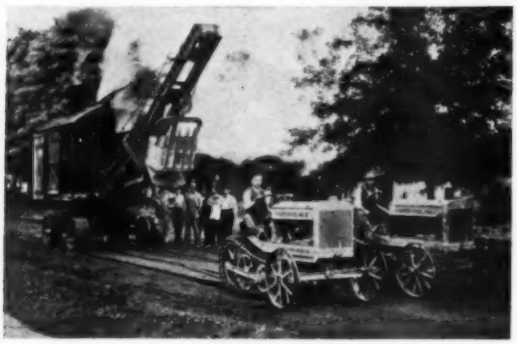


Five excavating machines working within a stone's throw of each other on one job is not a usual occurrence. These two views were taken on Brandon & Hanna's job on the big Lanyo Road sewer in Detroit. The cut in the foreground of the top view was taken by a small Marion shovel. At the extreme right is a Bucyrus Class-14 dragline digging along the center line of the sewer.

Just behind it can be seen the boom of an 18-B Bucyrus crane handling forms. To the left another Class-14 back-filling. Next to it an Osgood clamshell machine handling gravel for concrete work, and to the extreme left a Class-9½ Bucyrus dragline rehandling the material from the first Class-14. The view to the right was taken in the opposite direction.

Speedy and Economical Moving from One Job to Another

Peters & Baird, of Wadsworth, Ohio, road building contractors, move their 22-ton steam shovel and other machinery, from one job to another with their two Bates Steel Mule tractors, built by the Bates Machine & Tractor Company, Joliet, Ill.



Moving a Shbvel with a Bates Steel Mule

The photograph shows their equipment ready for the new job, after an eight-mile trip over country and city roads. One-half day was all that it required to transport their machinery.

The two tractors are kept busy hauling and grading, and Mr. Peters says "they are the greatest dirt-moving machines we ever used."

An excellent and easy method of fastening wire ropes with a better efficiency than rope clips can give and requiring less rope length, is the use of the wedge rope sockets. The rope is looped through a wedge shaped socket and a wedge large enough to prevent the rope from pulling through is inserted in the loop, tightening itself by the pull on the load end.

Central States News

J. H. Hensen is operating a 70-C Bucyrus shovel in a gravel pit near Wittenburg, Missouri.

John L. Roberts is operating an 18-B Bucyrus shovel for the Brooks-Callaway Company at Bauxite, Arkansas.

The Atchison, Topeka & Santa Fe Ry. is reported to have awarded a contract to the Bates & Rogers Construction Co., of Chicago, for the construction of a 38-mile cutoff between Ellinor, Kansas, and Eldorado. Plans have also been made for the construction of a 5½-mile belt line around the city of Eldorado.

Clinton Starke of Pine City, Minnesota, is operating an Erie-B shovel for S. J. Groves & Sons Company at Minneapolis on state highway work.

The Illinois Central Terminal has awarded a contract to the Great Lakes Dredge & Dock Company, Chicago, for, and is now undertaking, the construction of an earth-filled bulkhead to extend 435 feet into Lake Michigan from the present short line opposite Twenty-third Street and on the center line of the proposed South Park Boulevard Viaduct, to the property line acquired by its company from the city of Chicago pursuant to its electrification program, this bulkhead to involve the placing of about 100,000 yards of excavation from the lake bottom, and to permit in conjunction with an extension to be made by the city the filling in of all submerged property acquired from the city.

Intermountain News

BY H. N. STEINBARGER, DENVER

Mishou Clark & Teyssier of Pueblo, Colorado, recently finished their four and nine-tenths miles of State Highway work. They are now looking for a first-class job. The work just completed is known as the Colorado Federal Aid Project No. 191, and consisting of gravel surfacing with a small amount of grading beginning at the town limits of Baysfield, Colorado, and running northeasterly towards Pagosa Springs. This road is locally known as the Spanish Trail and is principally in the County of LaPlata, Colorado. The total amount of the contract was approximately $47,000.00, not a very big one for this energetic firm. Here's hoping they will line up something good in the near future.

Henry R. Phillips, railroad contractor, is now moving along in great shape with his State Highway contract between Colorado Springs and Manitou, Colorado. While this is a small contract for highway work yet it is an important one because it completes the connection of concrete pavement between the two above-mentioned towns.

Phillips is an old timer in the contracting business in this section, having followed the railroad construction for many years under the company name of Phillip's Construction Company & O'Gara. Several years ago this company dissolved and Henry R. retired from the contracting game. From recent activities it is very evident that he retired only temporarily. Several months ago he secured a Federal Aid contract from the State Highway Department of Colorado which he completed in splendid time and right up to specifications. After securing the contract he formed the Colorado Construction Company of which he is the principal owner and the guiding spirit. Here's wishing them good luck with the hopes they keep their constantly increasing line of equipment busy.

"Jeff" is gone from the land of sagebrush and wind, principally wind, of Northeastern Wyoming. About two months ago he "beat it" for the tall weeds around Zeigler, Illinois. It isn't exactly Jeff's fault because business took him there and we feel that business is the only thing that would take him away from the mountain states where he thrived for three years. We say thrived, because Mrs. Jeff was there, a real helpmate, keeping him from being lonesome and preparing food "fit for the Kings." Talk about mince pies and broiled venison, and by-the-way the mince pies were made with venison. They simply can't be beat and that is the reason Jeff is about as big as two of the original Jeffs. We want you to know that he carries a haymaker in each arm but he

doesn't use it that way. All the energy and strength is used in the direction of organizing and carrying through big contracts. What he is doing down in Zeigler we don't know because writing is evidently not Jeff's long-suit. He won't write but he does talk when he is around, and in everything he has to say there is a punch of a "Jeff" back of it because he can give you some real facts about the contracting business and modern machinery for handling it. The name? R. C. Jeffries; everybody should know that because there is only one Jeff in the contracting game. He had charge as superintendent of construction of all of the work on the Irrigation System of the estate of L. Z. Leiter near Clermont, Wyoming. The work consisted of the construction of a large reservoir or rather a large dam to raise the level of the water in Lake De Smet near Buffalo, Wyoming. This lake is owned together with something like 20,000 acres of land by the Leiter Estate. This lake never had a surface outlet, all the outflow being through underflow. To construct the dam it was necessary to excavate about sixty feet deep to bed rock, and in doing so the underflow was cut off and the water line raised. The overflow from this lake is now carried through ditches for irrigation of about 10,000 acres of property. The balance of the Leiter Estate lies above Lake De Smet and at the present time cannot be watered. Many miles of canal and ditch were constructed in the three years that Jeff was on the job. For two seasons between months of heavy weather Jeff used a Monighan dragline excavator, steam power, which he rebuilt after purchasing. The boom was lengthened, the revolving frame strengthened, suitable counterweight added so as to construct some of the deep ditches. Talk about deep canal work, on one place for about a quarter of a mile it was necessary to dig 65 feet deep. They thought Jeff couldn't do it but any time he undertakes a job it is going to be done. After two years of construction it was deemed advisable to purchase additional excavators, and after a thorough investigation he decided in favor of two Bucyrus 30-B gasoline-driven dragline excavators. They were placed in service early in 1921 and continued on the job until completed. One of these 30-B draglines has been shipped to Zeigler, Illinois, and Jeff is evidently tearing things loose around that section. We would like word from someone telling us what is going on back there, what he is doing and how he is doing it. We are quite sure he is thriving as usual because Mrs. Jeffries went back East with him.

Every year for a number of years the Colorado County Commissioners Association has held meetings in the City of Denver early in January during the period of the annual combination Stock Show, Horse Show and Machinery Exhibition. A great many new projects for road improvement throughout the State has necessitated the changing of the date of the annual meeting which would come in January, 1923, to an earlier date. October 16, 1922, has been decided upon, and Colorado Springs, Colorado, is the city that will entertain the Commissioners in the next annual meeting.

Fully 500 Commissioners, County Clerks and other road and county officials are expected to attend, as the Convention will be a very important one. The date of the meeting was advanced in order that the many important road improvements and bills could be threshed out before the next regular State Legislature convened. Heretofore these matters have been taken up by the Convention after the Legislature was in session, then presented to the Legislature, but it has not always been entirely satisfactory as there was not sufficient time to get the matter of the important problems in proper shape for consideration.

One of the important events each year in connection with the Convention, is the Annual Banquet given the County Commissioners, Clerks and other officials by the R. Hardesty Mfg. Co., of Denver. Each year they give a rousing good show and banquet immediately after the last meeting of the Commissioners' Convention. It is one of the biggest events of the season and is enjoyed by every commissioner and road man present. This year it will be given October 17th, at the Antlers Hotel, Colorado Springs, according to reports circulated at this time. We know it will be quite up to the Hardesty standard, and that means the best of everything.

It has recently been announced by Receiver J. H. Young of The Denver & Rio Grande Western, that $2,100,000 of improvements have been sanctioned by the U. S. Court on this line. On 250 miles of track, heavier rails will be laid and yard tracks at Pueblo, Grand Junction, Soldiers Summit, La Veta and Alamosa will be extended.

Charley Dooling with his "ever-ready" smile is back in the Rocky Mountain section. He has been hibernating around Kansas City for some time. We have not seen him, but from all reports burying himself in old Missouri has not harmed him in the least. It has been some time since a real contract has bobbed up for Dooling Brothers, and therefore the reason for the hibernating period. One would think Charley had about three sheets flying every time they see him, but we say, "nothing doing" because Charley absolutely and emphatically does not imbibe. "Not a drop" is the word now, and has always been even in the days when everything flowed freely on the ground level. Now that it all flows underground, as it were, and all that we see out in this country is questionable, we are quite sure that the answer will never be anything else but "nothing doing." How he gets that way and keeps that way is the eighth wonder of the world, but with it all Charley is always on the job when they have a contract and everything going merrily along in good shape. Ask him about the pencil holder.

Dooling Brothers and F. L. Hoffman is the combination that took this work. It consists of heavy road construction on Berthoud Pass, constructing a new road which will eliminate a section of the old road with very heavy grade. The work is very heavy with a great deal of hard rock. The contract was let by the United States Bureau of Roads. It lies on the east end side of the Continental Divide above Empire, Colorado. This job ought to be "easy picking" for this combination as they had a similar contract on the Estes Park, Colorado, Road about three years ago and they cleaned up and made a record on that job. Lets do it again.

Harry E. Fry pulled down a nice job and has his 14-B Bucyrus shovel going merrily for the fourth season on the Knife Edge Entrance Road to Mesa Verda National Park near Mancos, Colorado. Four and one-half miles will be built at this time, an improvement hoped for by every one making the trip to the Park.

Northwestern States News

BY A. R. HANCE, PORTLAND, OREGON

The Oregon State Highway Commission opened bids on July 25th and 26th for bridge and road work in various counties, and the following contracts for road work were awarded: Roscoe Neal—Island City-Elgin Section of LaGrande-Joseph Highway in Union County, 6.57 miles of surfacing Unit 1, and 11.49 miles of surfacing Unit 2; A. D. Kern—Newberg-Multnomah County Line on West Side Highway in Washington and Yamhill Counties, 15.7 miles of widening and resurfacing; S. C. Comerford—Stices Gulch, Baker Section of Baker-Unity Highway in Baker County, 15.55 miles of grading; Gus Carlson—Cummins-Valades Ranch Section of the John Day Highway in Grant County, 14.72 miles of crush gravel surfacing; Newport Construction Co.—Baker-Haines Section of Old Oregon Trail in Baker County, 9.4 miles of ditching and resurfacing; Warren Construction Co.—Astoria-Goble Section, Columbia River Highway, Clatsop and Columbia Counties, repairing bituminous pavement; Wallowa County Court—Lostine-Enter-

prise Section of LaGrande-Joseph Highway, Wallowa County, 7.89 miles of grading and surfacing.

Mr. Erick Oien, contractor, Arlington, Washington, was recently awarded contract for regrading and graveling 2¼ miles of the Verda Heights Road.

Mr. James A. Davis, chief engineer of the State Highway Department, Olympia, Washington, has resigned to become chief construction engineer for Siems & Carlson of Spokane. Mr. Davis has been chief engineer for nine years and is said to have been the highest paid officer of the state. Mr. Davis will be succeeded by Geo. T. McCoy, assistant chief engineer.

Mr. A. B. Gidley, Marshfield contractor, was low bidder and secured contract for the construction of the storage project and improvements to the water system at Coquille for which bids were opened recently. The work includes an earth and rock fill of 18,300 yards, 12 acres of clearing and grubbing, spillway wing, miscellaneous piping, valves and appurtenances.

Mr. Carl Nyberg, member of the contracting firm of Carlson & Nyberg of Spokane was recently in Pendleton, Oregon, making arrangements for beginning the work of grading and surfacing Deadman's Pass to Kamela Section of the Old Oregon Trail. The Oregon State Highway Commission has promised a bonus of $9,000 if the work is all done before this winter. A large force of men will be used on the job.

At a recent letting in Missoula, Montana, contract for building the Libby-Rexford Road on the Roosevelt Trail was awarded to Siems & Carlson of Spokane. The Pioneer Construction Co. of Bozeman was awarded the West Gallatin job, and Rick & Markhus, Missoula, the building of Lookout Pass Road from Sildex to the state line.

Bids were opened on July 21st by the Bureau of Roads, Portland, Oregon, for the construction of road in connection with Klamath-Sand Creek Section of Crater National Forest, and the Local Bureau has recommended that the award be made to Hill Construction Company, no allowance being made on the several small items they failed to bid on.

The Oregon State Highway Commission on August 5th awarded contracts on two units of the Mount Hood Road, as follows: 10.7 miles of rock surfacing on the Cherryville-Forest Boundary Section to A. D. Kern of Portland, on crushed rock; on the Multnomah County-Sandy Section, 6.2 miles of rock surfacing, to the Palmer Construcction Co. of New Era.

A saving of $40,000 was made by the state of Idaho on a contract for the construction of 7.75 miles of highway in Bannock County recently, it was announced by D. P. Olson, State Director of Highways, Boise, Idaho, upon his return from a tour of inspection over the state.

The state had estimated the work would cost about $85,000 Mr. Olson said, but when the bids were opened recently at Pocatello the low bid was $45,565.03. William Devlin of Mountain Home was the low bidder, and the contract has been tentatively awarded to him, pending the return of W. J. Hall, State Commissioner of Public Works.

Nine contractors submitted bids for the work, but the bid of Mr. Devlin was low. His estimate has the approval of the County Commissioners of Bannock County.

The Sloane Construction Co. of Spokane were recently awarded contract for the Island City-Elgin Section of the LaGrande-Enterprise Highway, Unit No. 2; 11.5 miles rock surfacing, bids for which were opened by the Oregon State Highway Commission, Salem, Oregon.

The Johnson Contract Company of Portland were successful bidder for the construction of Pine Creek Road; 4 miles of grading, involving 50,800 cu. yds. of excavation, at the letting of the Umatilla County Court, Pendleton, Oregon, July 27th.

The Triangle Constfruction Co. of Colfax, Washington, recently secured contract for 11 miles of road work on the Pacific Highway, Section No. 19.

The Mohr Construction Co. of Waterville, Washington, have been awarded contract for improving the three-mile connecting link of Permanent Highway No. 10.

Mr. H. R. Golden, steam shovel engineer, is once more handling the levers on Mr. Andrew Peterson's 70-ton Bucyrus shovel. Mr. Peterson who was formerly associated with the Northwestern Construction Company of Astoria, Oregon, is now associated with Mr. John Mattson of Astoria in the contracting business, and Mr. Golden advises that they have a big job to complete in the vicinity of Seattle, contract for which they were recently awarded.

Notes from Pacific Coast

BY P. H. BIRCKHEAD

Operations have been resumed at the Nevada Consolidated with a gradually increasing number of men. Employes previously in construction work are now in operation. All departments are active. Six ball mills with a daily grinding capacity of 2,500 tons are in operation; two steam shovels are working at the pit and 250 men are employed underground at the Ruth. A new reverberatory, 27 x 134 feet inside, has been completed at McGill and another of approximately the same size is ready for operation; only one reverberatory is being fired at this time; 500 men are employed at McGill; 35,000 tons of high-grade ore is ready for smelting.

The Los Angeles Pressed Brick Co. has started the construction of clay bins of 18,000 tons capacity at Cardiff, San Diego County.

The Norbell Clay Co. has been organized to develop the deposits of high-grade clay recently discovered in San Bernardino County, California. The material is suitable for porcelain and vitreous ware.

The State Highway Commission has awarded contracts for two pieces of highway paving in Southern California. The contract for 10.82 miles of asphalt and concrete surfacing and concrete shoulders on the road between Canada de las Llagas to Chiqueros Creek, in Santa Barbara County, was awarded to the Southwest Paving Company of Los Angeles at a price of $103,705.00. Materials to be furnished by the State will make the total cost of the project $237,701.60, as against the Commission's estimate of $264,908.72. The second contract concerns similar work on 8.77 miles between the easterly boundary of Orange County and San Juan Creek. The work was awarded to George H. Oswald of Los Angeles on his bid of $126,615. The state will furnish materials, which will bring the total cost of the work to $193,160.70, as compared with the Commission's estimate of $220,-537.73.

The South Park Dredging Co., owned by the Hammon dredging interests of California, is expending approximately one million dollars in equipment and preliminary operations in the vicinity of Bear and Elk Creeks, Idaho, where the company has acquired a large acreage with a view to extensive dredging operations. Included in the work now in hand is construction of a fifty-mile power line. Dredging operations are scheduled to start soon.

The Amador Central R. R. is preparing plans for extending its line 22 miles from Amador into the gold mining region, the track to be standard gauge.

With approximately $53,500,000 available for the year, California stands at the head of all states in appropriations for this purpose and represents increase over appropriation from all sources of preceding year exceeding $15,000,000. This amount represents Federal Aid authorized under Post Office Appropriation Act. Public road appropriations available for this fiscal year for other western states, as announced by Bureau of Public Roads of Department of Agriculture, include Arizona,

$6,500,000; Idaho, $12,500,000; Nevada, $2,500,000; Oregon, $20,500,000; Utah, $6,500,000; Washington, $18,500,000.

Contract has been awarded to S. P. Brownlee, San Rafael, California, who bid $0.119 per sq. ft. or $41,520.00 for the improvement of various streets, involving 267,000 sq. ft. asphaltic concrete wearing surface on existing roadways. Contract awarded on Type C, Warrenite Bitulithic type paving.

Bids were received on August 1st, by R. H. Elliot, manager of the Yuba Development Company, 1213 Hobart Building, San Francisco, for the construction of the Bullard's Bar Project at Bullard's Bar, 39 miles from Marysville, in Yuba County, this being the first unit of an extensive power development project for the Yuba Development Company. Contracts will be awarded as soon as possible. Contract was awarded to Bent Brothers, Los Angeles.

Palmer & McBryde, 503 Market Street, San Francisco, submitted the lowest bid for the construction of the Calaveras Dam in Alameda County, for the Spring Valley Water Company. Work will consist of raising the present Calaveras Dam from about 90 feet to 175 feet, involving rip-rap and 800,000 cu. yds. of earthwork. The dam is to be hydraulic earthfill type and is to be completed in two years. Water will be pumped to a higher elevation for sluicing; the pumps to be furnished by the Spring Valley Water Company.

There is quite a colony of shovel operators at Kingman, Arizona, some of them being Louis Baldwin, T. J. Brown, George Dawson, T. P. McCormick, T. N. Rives, W. E. Russell and Edward Stephens, and their activities have made the town a bustling city and revived the former prosperity of that section.

The Western States Gas & Electric Company have on their payroll George Breyer, Placerville, California; W. H. Elliott, Eugene Hurley and Mike Kuhlman, Minden, Nevada; J. A. Logue, Placerville; Walter Livingston, Minden; C. H. Osborne, Placerville; Albert Ruhr, Minden; Leo Stewart, Minden; Leo Sullivan, Placerville; E. F. Tiebelt, Placerville; G. T. White, Placerville.

Bent Brothers of Los Angeles are building the Henshaw Dam in San Diego County. About 500,000 yards of earth is to be moved in building this dam.

Final plans and surveys are being completed by the engineers for the Merced Irrigation District, Merced. Mr. R. C. Starr is chief engineer, and negotiations are now being made with the Yosemite Railroad Co. for a satisfactory adjustment of the compensation to be allowed by the District to the railroad company for the relocation of the Yosemite Railroad at the Exchequer Reservoir site. As soon as this matter is settled, probably within a week or so, bids will be called for by the District for the complete construction of the irrigation system.

Contract has been awarded to the Geo. Pollock Company, Forum Building, Sacramento, who bid $.35 yd. for 80,000 yds. excavation on Section One, Main Drainage Canal, of Reclamation District No. 833.

Contract has been awarded to C. R. Butterfield, 212 6th Street, San Pedro, for 30,000 cu. yds. excavation at White Point for a pleasure resort to be owned by R. D. Sopulveda.

Contract has been awarded to H. G. Fenton, Dewey and Main Streets, San Diego, who bid $7,875 for grading and excavation work at the San Diego Naval Base, bids received by Bureau of Yards and Docks, Navy Department, Washington, D. C. Unit bid of H. G. Fenton, 75c. per cu. yd.

Plans are made by Engineers Barton & Potter, Beckman Building, Lodi, for enlarging levees and installing pumping plants for Reclamation District No. 2061, Tubbs Island, Sonoma County, Black-Point Cutoff. Present property is valued at $212,985.00. Additional work as follows: Raising levees 78,400 yds., 17c. yd., $13,328; Dredge Canals, 73,400 yds., 17c. yd., $12,473.00; Bulkheads, $5,000.00; Total $30,806.

Contract has been awarded to the Utah Construction Company, Ogden, Utah, for the construction of a branch line from Delta to Fillmore, bids for the work received by the Engineering Department, Union Pacific System, Pacific Electric Building, Los Angeles.

It is announced in Salt Lake City that one of the first steps in the exploitation of the iron and coal deposits of Southern Utah, by the new corporation of which the Columbia Steel Co. of California is a nucleus, will be the building of a new branch railroad from Iron Springs near Cedar City, to the Union Pacific main line to Los Angeles. The junction point will be the town of Lund, and the road will be 24.6 miles long.

Contract has been awarded to C. R. Adams, Biggs, Butte County, for the construction of Division No. 2 and Division No. 3 of the Lake Yosemite-Le Grand Canal.

Southern States Notes

BY C. N. BALLENTINE AND W. W. WHORLEY

Construction work will be started at an early date on the Tombigbee River Bridge at Moscow, Alabama, on the Dixie Overland Highway. The work will be handled by Doullut & Williams of New Orleans, Louisiana.

The Vaughan-Davis Construction Company of Montgomery, Alabama, were low bidders on 20 miles of gravel road work in Macon County, Alabama. They plan to use an industrial railway for hauling supplies. W. D. Owens, Pelahatchie, was awarded the bridges on this project.

E. L. Batson of Birmingham was low bidder on 15 miles of road work in Limestone County, Alabama.

Stanley and Singer, LaFayette, Alabama, secured 3½ miles of road re-surfacing in Cleburne County.

Ed Israel is running a Marion 61 for the Sloss-Sheffield By-Products Plant at Birmingham, Alabama. Fred McAllister is craning and Ernest Israel firing.

Smith Company, Industrial Builders of Birmingham, Alabama, were low bidders on 18 miles of road work in Marion County, extending from Guin to the Walker County Line.

W. H. Kennewurf, who is handling a Class-14 Bucyrus dragline at Leeds, Alabama, dropped in recently to say "Hello." He is looking for his old friend A. C. (Al) Duesing, and would like to hear from him.

Al. Oldacre is in charge of an 80-B Bucyrus for the Pratt Consolidated Coal Company at their Gamble Mine. This machine is mounted on caterpillars and Al says that it can go anywhere and do anything except vote.

J. F. Markham of Knoxville, Tennessee, secured a nice road job in Roane County on July 28th, when bids were opened by the State Highway Department. Y. Y. Phillips of Martin, Tennessee, was low bidder on eight miles of work between Troy and Union City.

L. O. Pollock is handling a small revolving shovel in a gravel pit at Fort Gaines, Georgia.

The Carey Company is doing some excavating work at Lakeland, Florida, and are operating two Class-24 Bucyrus draglines, one of which is being handled by M. C. Hinton and Johnny Rankin, and fired by S. Carter and G. E. Emil, and the other in two shifts by George Anderson and Henry Hull, and fired by Tom Purcell and S. Bailey.

The Chicago, Burlington & Quincy R. R. is reported to have awarded a contract to F. Kell of Wichita Falls, Texas, for the construction of a 14-mile standard gauge branch line from Byers, Texas, to Waurika, Oklahoma.

T. W. Hooker writes that he is working for the C. R. Cummins Company on their new Austin machine, near Moore Haven, Florida.

James Rowland is running and L. C. Kirr is craning a Bucyrus 65-Ton shovel for the Brooks-Callaway Company at Bauxite, Arkansas.

26477

UMI

St. Louis Items

BY A. B. KOENIG

Mulvill Bros., Alton, Illinois, were awarded contract for grading the golf grounds for the Alton Country Club. They sublet this to J. J. McInerney.

Wm. Brothers is about through with his road work near Old Monroe, Missouri. He would like to place his 15-team outfit on to another job in this part of the country.

Mrs. Cooper & Sons have moved their outfit on to C. P. O'Reilly's road job in Missouri.

M. C. Connors & Co., 601 West Madison Street, Chicago, were awarded 65,000 yards of grading by the Burlington R. R. between Galesburg and Havana, Illinois. They will sublet this work to one or two good machine outfits. They also have 40,000 yards of fine station work to sublet on the Burlington R. R. north of La Crosse, Wisconsin.

J. W. McMurray Contracting Co., Kansas City, were awarded two concrete culvert jobs by the Wabash R. R. One of these is located in Illinois and the other in Missouri.

Thompson & McDaniel have a state road job near Huntsville, Missouri. They report a dragline idle south of Muscatine, Iowa, that they would like to place on a suitable job.

Miss Mildred Todd, the genial bookkeeper of the J. W. McMurray Contracting Co., Kansas City, is spending two weeks' vacation here with her school chum, Miss Beeman. She will visit their bridge work near Detroit, Michigan, before returning home.

Geo. Condon is attracting quite a lot of attention on his new work on the New York Central Lines near Buffalo with his new motorized grading outfits.

J. R. Ramsey came in from Parker City, Indiana, hunting work for his seven-team outfit.

Blythe Bros. have completed their team work on the Big Four R. R. near Parker City, Indiana.

McGuire Bros. have moved their team outfit from Parker City, Indiana, on to a similar job on the Illinois Central R. R. at Monee, Illinois.

Lane & Maloney have 85,000 yards of side borrow and 2000 yards of rock work to sublet on state road near Thebes, Illinois.

Frank Worrell Co., Morrilton, Arkansas, will have an Erie shovel and crusher plant idle in about 30 days. Would like to place one or both of these plants on some work in this part of the country.

Cropper Engineering Co., Arcade Building, Kansas City, Missouri, report a good bridge and pile-driving outfit idle.

L. J. Sexton, manager of the Walsh Construction Co. district office spent a day with us here. Sexton reports satisfactory progress on their Big Four work east of Muncie. Expect to finish the grading on this job shortly.

W. C. Hill of the Condon Construction Co., report finishing 7½ miles of state road work near Fowler, Illinois.

Alex. Maitland of the Kansas City Bridge Co. has about recovered from his recent illness. Maitland is going to motor north to the lakes in Michigan and Wisconsin and spend some time fishing with his oldest son.

A. Peterson, Webster Groves, Missouri, is looking for work for his 10-team outfit.

J. W. Moloy, Route 1, East St. Louis, Illinois, has a 12-team and wheeler outfit idle.

W. E. Callahan Construction Co. was awarded the drainage contract near Rushville, Illinois. About 200,000 yards in this job. Paul Grafe will be in charge.

Al Gilliland is back here hunting work for 25 teams and tractor outfit that he has idle at Johnson, Kansas. He just finished his Santa Fe job at Syracuse, Kansas.

R. G. Hill & Co. expect to finish the grading for the new Interchange Terminals at Memphis by September 1st. They will have a standard gauge steam shovel outfit, one narrow gauge outfit and 18 teams equipped with dump wagons, fresnos and wheelers idle. They will place all or any part of it on suitable work.

The Missouri Pacific R. R. Co. have opened bids for about a mile of trestle and steam shovel work on their line between Corning and Knobel, Arkansas. Up to the present writing the successful bidder has not been announced.

Bates & Rogers have opened a branch office at Eldorado, Kansas, with Mr. Ross in charge. Will sublet their Santa Fe work to both shovel and team outfits in quantities to suit outfits.

The Grand River Drainage District No. 1, Trenton, Missouri, has let the dredging contract to Fred M. Crane & Company of Omaha, Nebraska. The cost of the work will be about $225,000. The company announced that it will begin on the work at once. Six dams at a cost of $500 each will be built to force the water into the river.

Contractors when in want of work or labor for their outfits write or wire Koenig Labor Agency, 612 Walnut Street, St. Louis, Missouri, or 501 Delaware Street, Kansas City, Missouri.

McWilliam Dredging Co. have between 12,000 and 15,000 yards of nice team work to sublet near Triplett, Missouri. See their superintendent, H. H. Hanink, at Triplett, Missouri.

West Virginia

The Virginian Railway is said to have awarded a contract to H. M. Waugh, of Bluefield, West Virginia, to construct 3.6 miles of heavy railroad line from the connection with the Virginian & Western R. R. at Virwest, West Virginia, down Laurel Fork.

Canada

Vancouver Notes

The first basement excavation job by a steam shovel for a considerable time is being done by A. B. Campbell, contractor. The veteran runner, George Knox, is handling the levers.

Improvements on the Hastings-Barnet Road through North Burnaby, British Columbia, have started. The sum of $20,000 will be spent on this road this summer, and a like sum during each of the two following seasons, the cost to be borne jointly by the provincial government and the municipality of Burnaby.

H. M. Scott, of Peter Lyall & Sons, Ltd., who has been the firm's superintendent of the new Esquimalt drydock since the beginning of the work early last year, has been placed in charge of the company's work on the Welland Ship Canal.

Contract for construction of traffic bridge crossing the Coquitlam River at Port Coquitlam, British Columbia, has been let to Hodgson, King & Marble, London Building, Vancouver. Coughlan & Sons, of Vancouver, are understood to have received the subcontract for the steel fabric.

City Engineer Fellows of Vancouver, British Columbia, was instructed by civic water works committee to make an investigation into the causes and necessary remedy of flood conditions on the Capilano Creek, above the intake.

A proposal to harness the undercurrent of the Fraser River to drain and irrigate Lulu Island was favorably discussed by the council of Richmond, British Columbia, when Reeve Tilton reported on his investigations. J. Hudson, civil engineer, Vancouver, is the originator of the scheme. Council decided to test the scheme by experiment on a small scale.

George M. Davies is craning a Marion for the Canada Cement Company, near Calgary, Alberta, Canada.

Montreal and Vicinity

BY J. M. WARD, MONTREAL

O'Connors Limited, Huntington, Quebec, are making good progress with their contract for approximately fifty miles of resurfacing highways for the Quebec Depart-

ment of Highways. They have sublet some of this but are doing the major portion of it themselves.

Universal Contractors Limited, have a lot of highway work under construction at the present time. Mr. Thos. Cozzolino and Mr. Hamilton Lindsay are taking an active interest in this work.

Edgar Irvine, Dexter & Richards and Panetta & Keating are all doing highway work on Quebec Government Roads.

Simpson Bros., Montreal, have about five miles of highway work on the Montreal-Toronto Highway at Soulanges.

Quebec Streams Commission expect to call for tenders about September 1st for $2,000,000.00 Dam at Lake Kenogami, Chicoutimi County, Quebec.

It is rumoured that Price Bros., Limited, of Quebec, will shortly erect two new pulp and paper mills and a number or residences at Kenogami, Quebec. They also contemplate a railway line between Kenogami and Saguenayville.

Provincial Department of Highways, New Brunswick, are building a lot of culverts and bridges this year, total expenditures running into something like $2,000,000.00.

Town of Acton Vale, Quebec, are installing a mechanical filtration plant.

Hector MacNeill, Esquire, of Sydney Mines, Nova Scotia, has been awarded contract for new school.

Chas. Billie and W. V. Brennan are making rapid progress with their road contract, which they have taken from O'Connors Limited of Huntington, Quebec.

Geo. McLeod of the Terminals Construction Co., Halifax, has invaded the province of Quebec and is doing road work near St. Anne de Beaupre, Quebec.

Angstrom & Verochio of Toronto, who are doing the excavating work for E. G. M. Cape & Company, Limited, on the new reservoir at Montreal, have become so enamored with Montreal that they are thinking of locating there.

Thompson-Starrett Company have a full force at work on Three Rivers Pulp & Paper Company job at Three Rivers, Quebec.

Fraser-Brace & Company are completing some ships for the French Government at Three Rivers, Quebec.

It is reported that a party of prominent men from St. Johns, Newfoundland, have located a good, rich gold area on the coast of Labrador and it is expected that developments over there will ensue promptly.

A new company has been formed in Newfoundland and is endeavouring to sell bonds for the construction of a new line of railway throughout this colony.

If the efforts of the Government Representatives of Newfoundland are successful in the Old Country it is expected that great activity will commence on the construction of power development and pulp and paper plants in Newfoundland.

Toronto and Vicinity

We had a call recently from Mr. F. R. Wilford, President of the F. R. Wilford & Company, contractors, of Lindsay, Ontario. Mr. Wilford reports making good progress on their concrete and excavation work on their different jobs for the Department of Public Highways.

G. L. Campbell has recently taken a subcontract from P. Lyall & Sons Construction Company, Limited, for excavation work on Section 4 of the Welland Ship Canal. A. E. Rigby has also taken a subcontract for excavation on Section 3 of the same contract.

It has been announced by the Dominion Government that they will proceed with the plans to spend $500,000.00 on harbor improvement at Oshawa. The harbor there is controlled by the Dominion Government. These are the plans drawn up under the former administration.

Mr. King, Minister of Public Works in the Dominion Cabinet, paid an official visit to Toronto on August 10th when he was the guest of the Toronto Harbor Commissioners. He inspected the extensive work on the harbor front. There is possibly no city on the Great Lakes carrying out anything like the extensive reclamation work in progress at Toronto. The Harbor Board is making very valuable additions to the waterfront territory through hydraulic dredging.

The first meeting of the board of a new township was held on August 12th, and the newly formed North York Township was officially inaugurated. The meeting decided that one of the first duties of the new board is to institute road improvement, and it was decided that each commissioner should for the present look after the roads in his own section. Meantime an adjourned meeting has been called for August 21st. The appointment of officials, including the road engineer, will be taken into consideration.

John R. McQuigge, contractor of Arnprior, is carrying out considerable road grading for the Provincial Highway Department in the vicinity of Kinburn, Ontario.

Mr. Charles Billie, contractor of Montreal, who has been doing extensive grading for the Provincial Highway Department at Shelburne, Ontario, is making good progress. His steam shovel work is about finished and he is using some Western grading equipment.

We note with regret the death of Mr. V. Castellani, President of the Castellani Construction Company, which took place as the result of an automobile accident. His firm was amongst the most successful of the many excavating and grading contractors in this vicinity and has carried out some very successful work on some of the most important jobs, including the Chippewa Power Canal.

The death of John Allan, a former member of Parliament and former mayor of Hamilton, Ontario, terminates one of the most active lives in this vicinity. Mr. Allan for many years engaged in the contracting business in New York City where he was very successful. Since 1908 he has taken a prominent part in the welfare of the City of Hamilton in connection with the Board of Works, Board of Control, and Park Board.

We are pleased to note the Province of Alberta has filed plans for approval to take its part in the National Highway Scheme under Canadian Highways Act. This brings all the Provinces of Canada under the general regulations provided in the act. Road building in Canada is on the upgrade, although in most parts of the country there was a hesitation in spending money during the earlier part of the season. The Province of Ontario in June let contracts to the extent of $1,700,000.00.

McNamara Brothers are making good progress in their road work at West Hill near Toronto.

Curran & Cooke of Guthrie, Ontario, are making good progress with their grading work. They recently ordered their second shipment of Western goods.

Merlo, Merlo & Ray, Limited, of Walkerville, Ontario, have commenced operations on some road work just east of Toronto. Mr. Thompson is looking after their interests and making his headquarters at West Hill, Ontario.

Webster Construction Company of London, Ontario, reports making good headway on their grading work. Mr. Webster occasionally finds time to pay a visit to Toronto and say Hello to some of his friends. He was a recent caller at our office.

J. E. Caughey of Wallaceburg is making good progress on his work near that place.

We recently had the pleasure of inspecting one of the gravel pits operated by Kent County in company with Mr. L. A. Pardo, County Superintendent, and Mr. Fletcher, County Clerk. Kent County has some of the best gravel roads in the Province.

We recently visited some of the grading and road work carried out in the vicinity of Windsor, Ontario, by the Cadwell Sand & Gravel Company of Windsor, Ontario. Mr. Kerrigan, President of the Company, advised us that they had taken on considerable road work in Lambton County.

Excellent progress is being made on the concrete road with bituminous top under construction in the vicinity of Kingsville, Ontario. Merlo, Merlo & Ray, Limited, of Walkerville is carrying out the work.

The Godson Contracting Company has started a paving race against time for the Canadian National Exhibition which opens in Toronto, August 26th. They undertook to lay 21,000 square yards in eight days of 1½-inch binder and 1½-inch top sheet asphalt. As we go to press the job is well advanced, two gangs working twelve hours a day with two portable asphalt plants.

The Warren Bituminous Paving Company of Ontario, Limited, have just completed two miles of paving on the Sutton Road, north of Sharon. This consists of concrete foundation and bitulithic top. If expression of satisfaction means anything, the public will insist on more of this being laid. The Warren Company have also just completed similar paving job at Lansing of 1¼ miles.

On August 14th the Council instructed their engineers, James, Proctor & Redfern, Limited, to prepare plans for seven miles of water mains, which includes one mile of 16-inch main in New Toronto. Contract was awarded to the Central Foundation Company, Toronto, Ontario, of which R. C. Huffman is president. The job approximates $100,000.00. It is understood it will be completed before cold weather. The excavation is well advanced now.

Prizes will be given for the best paper on "*Use of Vitrified Clay Pipe in Plumbing Systems*," the announcement of which was recently made by S. E. Dibble, College of Industries, Carnegie Institute of Technology. The contest will be open to all plumbing and heating dealers as well as students and instructors in all institutions where drainage is taught. The total amount of prizes is four hundred dollars.

Detailed information regarding the contest may be obtained from R. S. Clark, office of the Secretary, Carnegie Institute of Technology, Pittsburgh, Pennsylvania.

TRADE NOTES

Du Pont Insurance Plan

Under the group insurance plan of the du Pont Company, a total of $420,114 has been paid, during the past three years, to beneficiaries of deceased or disabled employees. The plan provides that all employees who have been with the company for six months or more are insured, at no cost to themselves, in amounts ranging from $1,000 to $1,500, depending on length of service.

If an employee is totally or permanently disabled, before he attains the age of sixty years, payment of amount of insurance will be made. This is in addition to whatever benefits may accrue to the employee from the operation of workmen's compensation laws. It also protects the employees who may be totally and permanently disabled outside of working hours, and whose case would, therefore, not be covered by the provisions of the workmen's compensation laws.

J. Thompson Brown has been appointed General Manager of the Explosives Department of E. I. du Pont de Nemours & Company to succeed the late Charles A. Patterson.

Mr. Brown was first employed by the du Pont Company in 1903 and has been engaged in plant engineering and special and general operating work at the high explosives plants. He has held the positions of secretary to assistant director, manager of dynamite works, general superintendent of the high explosives division, and finally assistant general manager of the department.

He is a graduate of Virginia Polytechnic Institute and also took a course in engineering at Cornell University.

The Ashburn Works of E. I. du Pont de Nemours & Company, near Hannibal, Missouri, will resume the manufacture of high explosives early in September. This plant was closed down about a year ago when the slump in business conditions caused a falling off in the consumption of dynamite. During the time of the shutdown, the trade logical to the plant was supplied from other operating works. The improvement in business conditions, resulting in increased demands for high explosives, makes it necessary to resume operations. The Ashburn plant has a capacity of about 15,000,000 pounds of high explosives per year.

When We Struck Tents

When we struck tents in the Army and rolled our packs for some other unknown camp, WE TOLD THE WORLD ABOUT IT (unless the censor got on our necks). We wrote to our mothers, wives, sweethearts, uncles, aunts and cousins without end. You should be just as eager to tell us when you "pull up stakes." *Don't keep it a secret—tell us about it.* If you don't the *Postmaster* will send your *Excavating Engineer* back to us (if he is on to his job), and off goes your name from our list. You will be dead—as far as we know. DON'T BE A DEAD ONE. You will find in your magazine a sheet of postal cards. Tear out one, tell us your old and your new address, stick on a one-cent stamp and mail it to THE EXCAVATING ENGINEER, South Milwaukee, Wis.

The Desert Prospector

By M. M. St. Clair

Bent was his form, with its load of years,
Sparse his hair, and streaked with gray;
Dim were his eyes with sun that sears
And winter storms that chill and flay.

But his heart was stout and his mind was keen
And his soul minded not heat nor cold, I ween,
As he gallantly trudged with his laden jack
His hard-earned grubstake in its canvas pack.
"We'll strike it this time," he cheerily calls,
As they slowly climb the canyon walls;
"We'll come back rich, Jack and I;"
But the patient burro makes no reply.

Alone in the night, when his work is done,
And the desert stars show one by one,
Sometimes he wonders, in the shadows dim,
Just where he'll go when he "cashes in."
Half-hearted he hopes that the preacher's wrong
About the streets of gold and the heavenly song.
No heaven for him in gold ready-found,
But hidden deep in the stony ground,
To be searched and toiled and perhaps uncovered
In some Eldorado by him discovered.
No heavenly song to him as sweet,
As when steel and quartz in "contact" meet.

—*Engr. and Mining Journal.*

Fully Informed

The Boss: "I'm afraid you are not qualified for the position; you don't know anything about my business."

Applicant: "Don't I, though! I am engaged to your stenographer."

REVIEW OF BOOKS and CATALOGS

We shall be glad to review, in this column, such books and catalogs as are sent to us.

LINK-BELT POWER HOE (IMPROVED DRAG SCRAPER)—A 24-page, 6 x 9, two-color booklet, explaining and describing with illustrations the Link-Belt Power Hoe, and with diagrammatical views showing its simplicity of operation employed in combination with other elevating and conveying machinery. It points out also how the method of loading trucks and box cars from storage piles and railroad trestles, and stocking out coal piles may be simplified by the use of the Link-Belt Power Hoe. Booklet may be obtained from *The Link Belt Company, Chicago, Illinois.*

MORE PROFIT ON YOUR EXCAVATING WORK—An excellently prepared, 8½ x 11, 4-page, two-color leaflet describing with illustrations how profit may be gained by the contractor in cut-and-fill work, road grading, alley and street excavating, loading from sand and gravel pits, stone quarries, stripping the overburden from quarries, etc. Literature may be obtained upon request from *The T. L. Smith Company, Milwaukee, Wisconsin.*

WESTERN EQUIPMENT IN MILL, PIT AND QUARRY WORK—Catalog No. 53, a 16-page, excellently prepared booklet showing with photographic illustrations and brief descriptions, some installations and methods used at various cement mills, plants and quarries, where Western Equipment plays a part. Catalog may be obtained on request from *Western Wheeled Scraper Company, Aurora, Illinois.*

Black Gum Dragline Rollers

We are manufacturers and exclusive sellers of our famous Louisiana Highland Black Gum Rollers. We give our entire time to manufacturing Rollers and no other products. In manufacturing our Rollers we save no expense in producing a high-grade article.

In the manufacture of our Rollers, quality is our standard and not price.

Try a set of our Rollers and be convinced of their high quality. Ten years of experience in the business.

DOHERTY-WALSH ROLLER CO., Baton Rouge, La.

EASTON CARS

Easton Rocker Dump Cars in Quarry Service

Bulletin No. 2 gives data on Easton Rocker Dump Car, listing standard specifications. Special designs and equipment for every purpose.

"Quarry Car Practice" sent to quarrymen on request.

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The Sanitary District of Chicago. —"RHOPAC" is being used today on forty-two rotary water turbine shafts (12 in., 14 in. in diameter). Before "RHOPAC" was installed, the shafts, running 164 revolutions per minute in oil, had been badly scored and cut by flax packing. When "RHOPAC" was installed without the shafts being turned up, all trouble ceased and the test was so satisfactory that the whole plant has now been packed with your Flexible Metallic Packing.

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"RHOPAC" is easy to install. Pull the packing close around the piston rod and cut ring with ends square so there will be no opening where ends come together. Seat each ring separately within the gland. Joints should be alternated on sides of box, never placing a joint at the bottom of packing box. When completely packed, tighten the gland until leakage stops.

Write for sample and complete information on how to reduce your packing troubles and expense.

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FOR SALE

Rock Crushing Plant. Rock that tests 85% lime; fully equipped ready to operate; 20 acres of rock on hill plant and side track at bottom gravity operation. At sacrifice.

The Hastings Stone Co., Inc. Hastings, Minn.

FOR SALE

Bucyrus 14-B revolving shovel, caterpillar mounted, standard boom and ¾-yard dipper, equipped with power boom hoist. Sewer dipper stick, set of flues and repair parts extra. Shop No. 3333. As good as new. F. O. B. Decorah, Iowa. Easy terms. Address W. R. Shipman Construction Co., 209 Iowa Bldg., Sioux City, Iowa.

FOR SALE

Vulcan shovel, shop No. 1097, in good condition and shows very little wear. Has handled only 25,000 cubic yards. 2½-yard dipper. Equipped with a new 65 H. P. Scotch Marine Boiler. Stored near Dayton, Ohio. For full information address P. O. Box X, The Excavating Engineer, South Milwaukee, Wis.

FOR SALE

One Marion Model 20—45-ton standard gauge railroad shovel, shop No. 1050. T. J. Quinn, Ashton, Rhode Island.

FOR SALE

One Thew Type O shovel, shop No. 1557.

SPRUCKS BROS. CONSTRUCTION CO.
SCRANTON, PA.

FOR SALE

150-B stripping shovel in first-class used condition. Central location—shovel can be seen in operation. Apply P. O. Box AX, Excavating Engineer, South Milwaukee, Wisconsin.

FOR SALE CHEAP

One nearly new WESTERN ELEVATING GRADER, only been used a few days. Complete with engine hitch and push cart and in A-1 condition. Original cost $1500. Priced to sell.

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Two Views of Finley Brothers' Bucyrus 20-B Shovel Working in a Solid Rock Cut Near Monroe on Trunk Line No. 42 in Southern Wisconsin